PIPADOR REVISION

MRCOG Part 1 Revision Notes

Development of the Bladder

EMBRYOLOGY • LECTURE 56

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG Part 1 Revision Notes

Lecture 56: Development of the Bladder

Embryology • Visual revision edition

COLOUR CODE USED THROUGHOUT THESE NOTES

VESICAL PART	PELVIC PART	PHALLIC PART	WOLFFIAN DUCT	CLINICAL

LEARNING OBJECTIVES — tick off as you go

- ☐ Describe division of the cloaca and the three parts of the urogenital sinus.
- ☐ Explain formation of the trigone and separation of ureteric and Wolffian openings.
- ☐ Describe the urachus and its remnants.
- ☐ Outline bladder innervation.
- ☐ Recognise exstrophy, posterior urethral valves, VUR and megacystis.

1 The Cloaca and Its Division

IN ONE LINE: *The bladder comes mainly from the upper (vesical) urogenital sinus — endodermal lining, mesodermal muscle.*

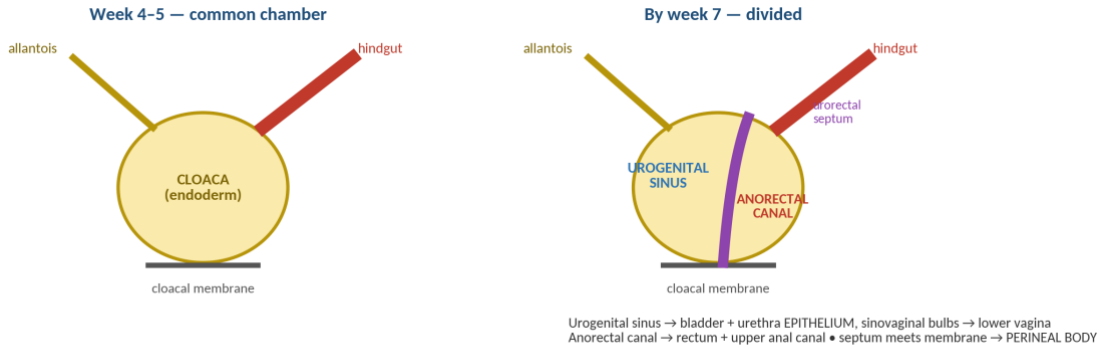


Figure 1. The urorectal septum divides the cloaca (from Lecture 49).

- End of week 4: **cloaca** — endoderm-lined chamber receiving the hindgut and allantois, closed by the cloacal membrane. By **week 7** the **urorectal septum** separates the **anorectal canal** (back) from the **urogenital sinus** (front); the membranes break down around weeks 7–8.

2 The Urogenital Sinus

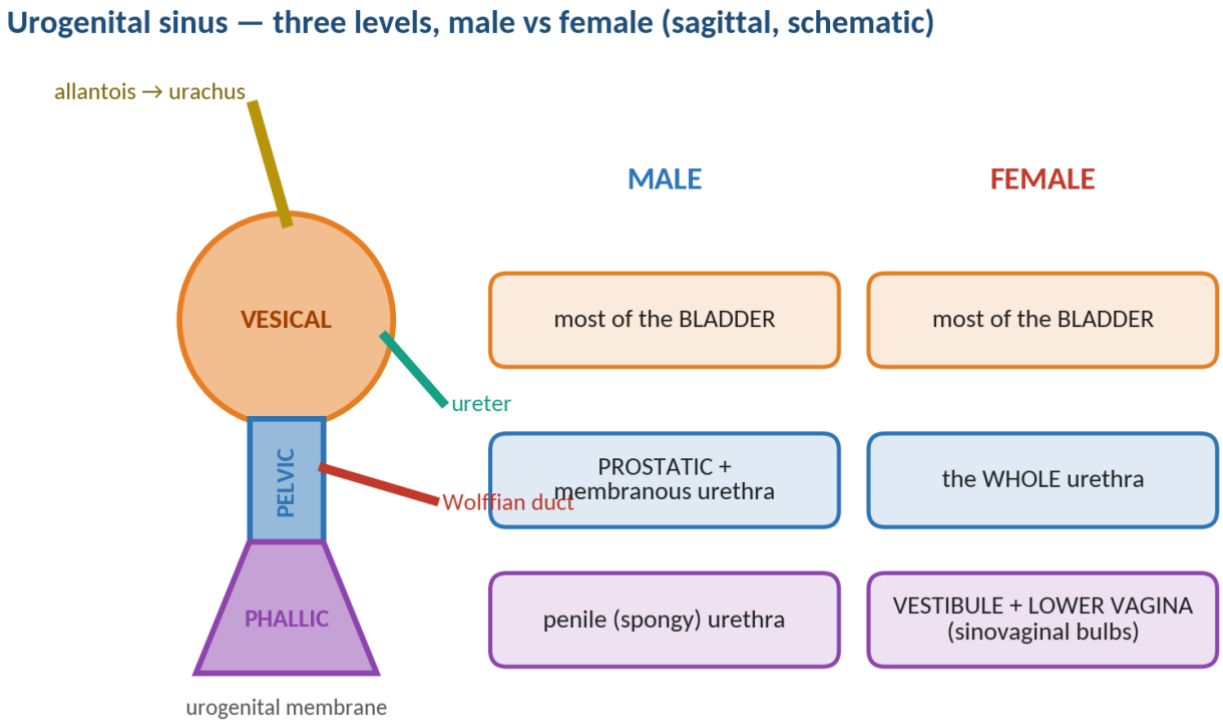


Figure 2. Three levels of the urogenital sinus.

- **Female**: bladder + **whole urethra** + vestibule + **lower vagina**. The vagina has a **dual origin**: upper part Müllerian, lower part from the **sinovaginal bulbs** (endoderm).
- **Male**: bladder + prostatic, membranous and penile urethra; the tip (glandular urethra) was classically said to come from an ectodermal cord — newer evidence points to endoderm. Failed urethral-fold fusion → **hypospadias**.

3 Trigone and Urachus

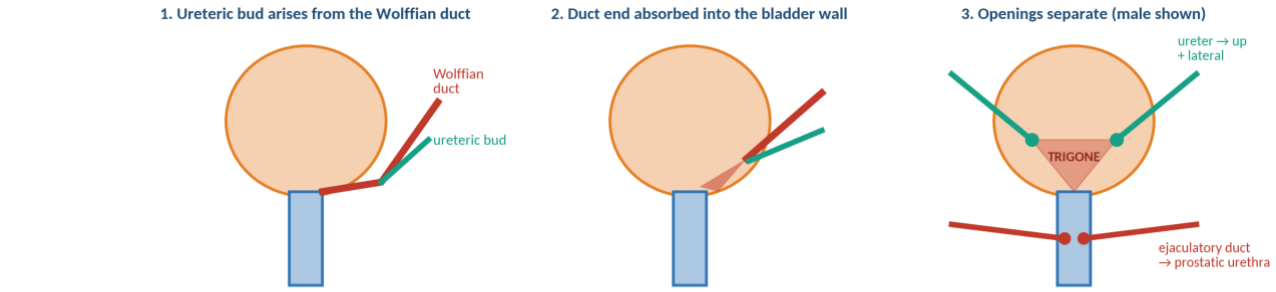


Figure 3. How the trigone forms.

MNEMONIC / MEMORY HOOK

'Ureters go UP and OUT, Wolffian ducts go DOWN and IN' — ureteric orifices move up and laterally in the bladder; Wolffian ducts end in the prostatic urethra (ejaculatory ducts at the verumontanum).

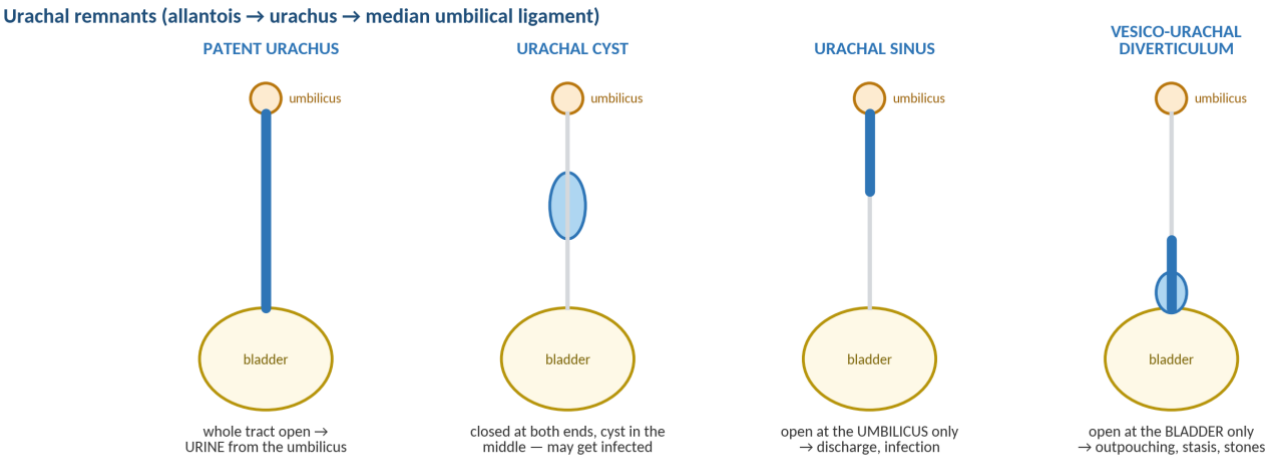


Figure 4. Urachal remnants.

- Symptomatic remnants (infection, discharge) are **excised**. **Urachal adenocarcinoma** is rare but recognised in adults.

4 Innervation and Capacity

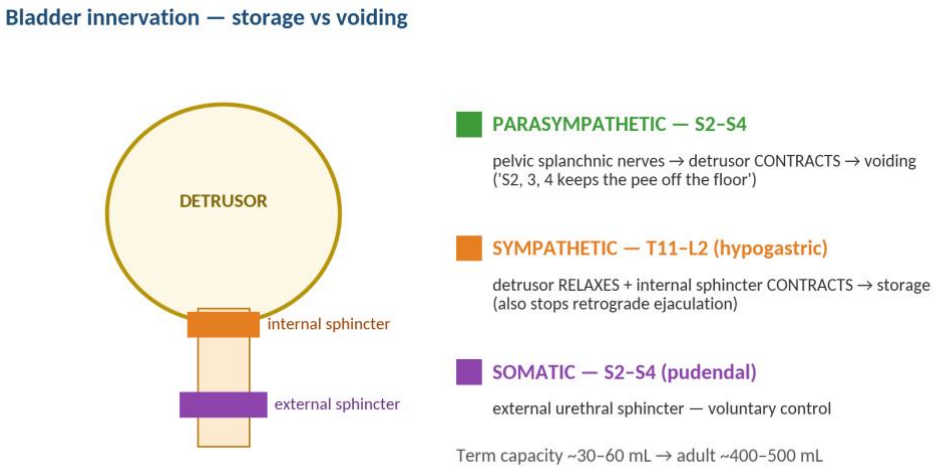


Figure 5. Storage vs voiding.

- Sympathetic roots are quoted as **T10 or T11 to L2** in different sources — either is accepted.

5 Congenital Anomalies

Anomaly	Key points
Bladder exstrophy	Mesoderm fails to grow between cloacal membrane and ectoderm → open bladder plate on the lower abdomen; ~1 in 30 000–50 000, boys > girls; epispadias, pubic diastasis, anterior anus. Planned birth in a specialist centre; staged repair
Cloacal exstrophy	More severe (~1 in 200 000+): OEIS — Omphalocele, Exstrophy, Imperforate anus, Spinal defects
Posterior urethral valves	Boys; membranous folds in the posterior urethra. Antenatal megacystis + 'keyhole' sign + bilateral hydronephrosis + oligohydramnios. Postnatal cystoscopic ablation; VURD syndrome; selected cases get a vesico-amniotic shunt

Anomaly	Key points
Vesicoureteric reflux	Short intramural ureter / abnormal trigone. Grades I–V. UTIs, scarring. Selective antibiotic prophylaxis; endoscopic injection (dextranomer–hyaluronic acid — Teflon is no longer used) or ureteric reimplantation
Bladder diverticulum	Usually paraureteric (Hutch) when congenital
Persistent urogenital sinus	Urethra and vagina share one opening — often virilised CAH or a cloacal malformation

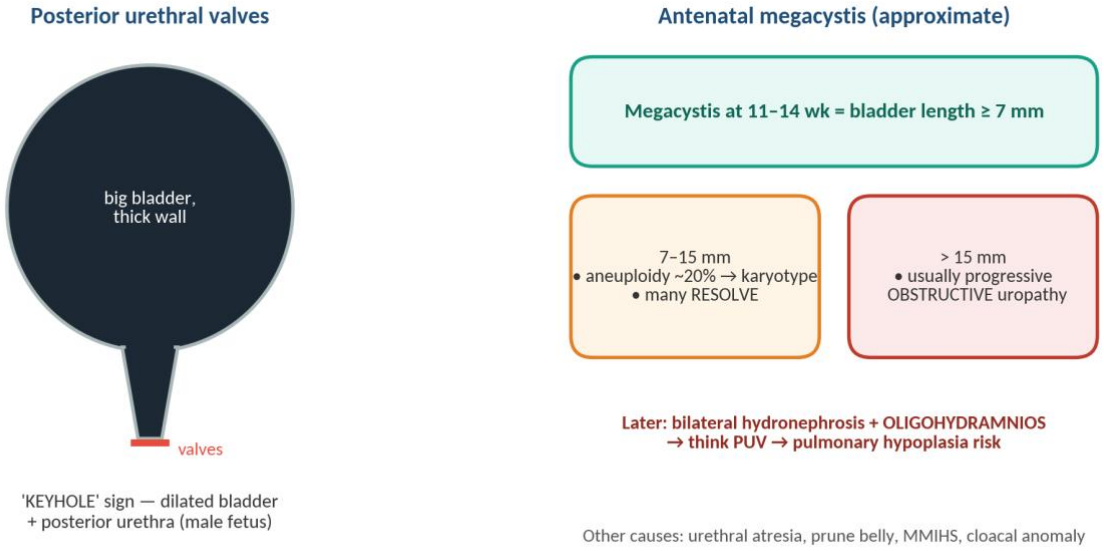


Figure 6. Megacystis and posterior urethral valves.

★ **PEARL**

Male fetus + big bladder + keyhole sign + bilateral hydronephrosis + oligohydramnios = posterior urethral valves until proven otherwise.

Allantois → urachus → median umbilical ligament — discharge or a midline mass between bladder and umbilicus is a urachal remnant.

6 MRCOG Exam Pearls — Last-Minute Page

Numbers to know

Week 7 Cloaca divided	**~12 wk** Bladder seen on scan	**≥ 7 mm** Megacystis at 11–14 wk	**> 15 mm** Likely obstruction
30–60 mL Term bladder capacity	**S2–S4** Detrusor + ext. sphincter	**1:30 000–50 000** Bladder exstrophy	**I–V** VUR grades

HIGH-YIELD CHECKLIST

- ☐ Urorectal septum divides the cloaca by week 7.
- ☐ Urogenital sinus: vesical → bladder; pelvic → prostatic urethra / whole female urethra; phallic → penile urethra / vestibule + lower vagina.
- ☐ Bladder lining endoderm; detrusor splanchnic mesoderm.
- ☐ Trigone: classically incorporated Wolffian duct; ureters move up + out.
- ☐ Allantois → urachus → median umbilical ligament; four remnant types.
- ☐ Parasympathetic S2–4 voids; sympathetic T11–L2 stores; pudendal S2–4 external sphincter.
- ☐ Bladder exstrophy: failed mesoderm ingrowth; epispadias, pubic diastasis.
- ☐ Cloacal exstrophy = OEIS.
- ☐ PUV: keyhole sign, oligohydramnios; megacystis ≥ 7 mm at 11–14 wk.
- ☐ Vagina: upper Müllerian, lower sinovaginal bulbs.

Self-assessment — cover the right-hand column

Question	Answer
What divides the cloaca?	Urorectal septum (by week 7)
Which part of the urogenital sinus forms the bladder?	Upper (vesical) part
Female derivative of the phallic part?	Vestibule + lower vagina
Classic origin of the trigone?	Incorporated Wolffian (mesonephric) ducts
Adult remnant of the allantois?	Median umbilical ligament (via urachus)
Remnant open only at the umbilicus?	Urachal sinus
Cause of bladder exstrophy?	Mesoderm fails to grow between cloacal membrane and ectoderm
Antenatal signs of PUV?	Megacystis, keyhole sign, bilateral hydronephrosis, oligohydramnios
Nerve supply of the detrusor (voiding)?	Parasympathetic S2–S4 (pelvic splanchnics)
Four causes of antenatal megacystis?	PUV, urethral atresia, aneuploidy, MMIHS (also prune belly)

7 References

- Sadler TW. Langman's Medical Embryology. 14th ed. 2019.
- Liao AW et al. Megacystis at 10–14 weeks of gestation: chromosomal defects and outcome. Ultrasound Obstet Gynecol 2003.
- NICE CG54. Urinary tract infection in under 16s. 2007 (updated 2022).